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26 January 1983

Worldwide Report

NUCLEAR DEVELOPMENT AND PROLIFERATION

No. 176

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CONTENTS

FRANCE MAY SELL POWER REACTOR, SUPPLY TECHNICAL AID TO CHINA

Paris LE MONDE in French 23 Nov 82 p 46

[Article by B.D.: "France Could Supply Nuclear Reactor Core to China"]

[Text] China's desire to buy a nuclear reactor from France is something like the story of the sea monster. Back in 1974 the Chinese had already shown their interest in the gas-graphite [reactor] system, which had, however, been abandoned by the French in 1969.

Peking's opening to purchases of Western equipment in 1978 led the Chinese at that time to plan on buying two PWR reactors from Framatome [Franco-American Atomic Construction] and Creusot-Loire. A French trade mission had surveyed the possible sites in China and had gone ahead with fairly detailed technical studies. Alas, the lowering of the principal economic objectives during the course of 1979 led to "setting the project aside." Between Giscard d'Estaing's trip and that of Michel Jobert in November 1981, each arrival of officials in Peking has been an opportunity to discuss nuclear [reactors] again with more or less interest.

Li Peng, the Chinese vice-minister of water conservancy and power, who just met with Chevenement on 19 November, came to Paris especially to talk about the purchase of a reactor.

The location of a 900-megawatt reactor in Kwangtung Province--and perhaps of two reactors in the long term--would make it possible to supply electricity not only to Canton but also to Hong Kong, whose China Light and Power Company would buy current.

The strong British presence in Hong Kong, however, justifies the French becoming partners with the English to build the first reactor. Framatome would supply the nuclear portion (a contract on the order of Fr 2 billion) and the British, through the GEC (General Electric Company), the conventional portion (the turbines).

Li Peng discussed the matter thoroughly with industrial leaders and financiers in France. In the industrial context, while the Chinese seem to be disposed to build this reactor with the French and the British, they want one [country] to be responsible and therefore, the leader.

For funding, the French have made proposals (credit over 15 years at a consensus rate, or 10 percent or currency credit at the rate of the currency in question).

The Chinese have listened. But the decision to order the reactor is not to be made prior to the end of the first half of 1983, if it is made. The French, however, are optimistic. Nuclear power has obviously again become a Chinese priority. Zhang Shang-ji, vice-minister of nuclear industry, came through a few weeks ago to ask for technical aid for the development of a Chinese 300-megawatt reactor. The CEA [French Atomic Energy Commission], which sees an export market for smaller reactors than the French standards of 200 and 300 megawatts, had begun to study the development of a power of 300 megawatts [as published]. An agreement for technical cooperation could, therefore, be signed during 1983.

In further proof of the the Chinese interest in atomic energy, the first exposition of Chinese nuclear technology opened recently in Chengdu (southwest China). Peking authorities have permitted an exposition on French nuclear technology to take place next September in the Chinese capital.

9969
CSO: 5100/2525

JAPAN-U.S. NUCLEAR FUSION TEST OBTAINS BETA FACTOR OF 4.6 PERCENT

Tokyo KAGAKU SHIMBUN in Japanese 1 Oct 82 p 1

[Text] As a part of nuclear fusion research and development based on the Japan-U.S. agreement on energy research and development cooperation, Japan Atomic Energy Research Institute [JAERI] (Board Chairman: Tsuneo Fujinami) has sent its staff to General Atomic of the United States since August 1979 to carry out experiments to obtain a high beta value in a plasms of noncircular cross section by using the "Doublet III Test Device." At 2 am, 29 August, the joint Japan-U.S. experiment achieved a high beta value of approximately 4.6 percent, much higher than the values obtained so far, as the average beta value for the entire core of the device. The device was originally proposed by Japan (JAERI) and has a D-shaped (kidney-shaped) cross section. The attained beta value is much higher than the previous record of about 3 percent obtained with JFT-2. The new record has reached an average beta value of nearly 5 percent, a value required in the international tokamak test reactor "INTOR," as well as in the "Nuclear Fusion Test Reactor" that will be built as a successor to the critical plasms testing device "JT-60" presently under construction at JAERI. This achievement was highly praised at the Ninth International Conference on Plasma Physics and Controlled Fusion organized by IAEA (International Atomic Energy Agency) and helf in Baltimore in early September.

In order to achieve self-ignition and maintain nuclear burning of plasma in a fusion reactor, ultrahigh temperature plasma must be confined in the reactor. In a magnetic confinement device such as a tokamak reactor, hto plasma is confined by magnetic fields (the plasma in the reactor is compressed by the magnetic field pressure, acting against the plasma gas pressure). The ratio of plasma pressure to magnetic field pressure is called the beta value and is usually expressed as a percentage.

Thus, it is possible to confine a plasma with weak magnetic fields in a reactor with a large beta value. This will result in the reduction of technical difficulty associated with the generation of magnetic fields, smaller device size, and a great reduction in construction cost.

Theory suggests that a high beta value can be obtained in a noncircular plasma cross section, elliptical or D-shaped. It has been an important task in the research and development of nuclear fusion to prove this theory.

The experiment conducted on Doublet III has not only proven that noncircular plasma generates a high beta value but has also produced a world record of 4.6 percent.

The average beta value of 4.6 percent was attained in the following manner: (1) plasma aspect ratio (vertical versus horizontal size) = 1.4; (2) average plasma density = 7 x 10^{19} particles per cm^3; (3) central plasma temperature = 550 electron volts; (4) plasma current = 340 kiloamperes; (5) toroidal magnetic field strength = 6.4 kilogauss; and (6) input power of neutral beam injection heating = 3.5 magawatts.

These results were obtained during the first phase of high beta experiments in which the plasma was heated by increasing input from two neutral beam injectors which were installed in September of last year. A third neutral beam injector will be installed next summer. The experiment, which is designed to achieve higher beta values by raising the plasma density and temperature, will continue. The objective of the experiment will be to understand the limitations imposed on beta values and confinement characteristics in high temperature plasmas. Then, the experiment will enter the "Big D Project" phase by replacing the current vacuum vessel with a larger, D-shaped vessel. The new vessel will be used in elucidating research topics essential to a high performance fusion device, such as the understanding of the characteristics of a large volume, noncircular plasma and size of an actual reactor (25 M^3) and the verification of high beta values in the high temperature regime.

In anticipation of improved beta vlues, a design standard of five percent has been assumed in the international experimental Tokamak reactor "INTOR" and JAERI's "Nuclear Fusion Test Reactor," which is to be built after the "JT-60" Tokamak. The significance of this experiment is not limited to achieving a world record in average beta value, but it also supports the realistic expectation of reaching the beta values needed in experimental fusion reactors.

9829
CSO: 5100/4207

URANIUM CONCENTRATE PLANT INAUGURATED

Buenos Aires MERCADO in Spanish 11 Nov 82 pp 43-45

[Text] Despite the pressures from the big powers and the nation's economictroubles, the Argentine nuclear plan is gradually becoming a reality. Argentina took a significant step forward when it started to produce its own nuclear fuel. Another important step will be the start of operation of the Los Gigantes mining and industrial complex, located in Cordoba province, scheduled to open next week. This complex is the result of a contract between the CNEA [National Atomic Energy Commission] and the Eduardo Sanchez Granel firm. Operating under this contract, Sanchez Granel built the first private uranium concentration plant in the non-industrialized world. This places Argentina in an excellent position for achieving the objectives of its nuclear plan.

The contract signed by Sanchez Granel and the CNEA covers the completion of the definitive project, prospecting, exploration, evaluation and mining of the area for a 15-year period, under the general supervision of the CNEA, which will receive the entire production of uranium concentrate, or yellow-cake. The construction and start of operation of the complex has taken 3 years and an investment of approximately 300 billion pesos. The financing for the project was provided as follows: 50 percent by the Sanchez Granel firm with the balance provided by bank credits from the National Development Bank, the Rio Bank, Citycorp, and a consortium formed by the Shaw Bank and Brown, Shipley & Co of England. In all, 130 people will be employed, including both professionals and workers.

The area involved consists of 100 square kilometers and is located 80 kilometers west of the city of Cordoba. The estimated reserves amount to 1,000 tons of uranium and are considered low-grade nuclear raw materials. Nonetheless, the CNEA has decided to work this field, using three uranium concentrate plants: San Rafael and Malargue in Mendoza, and Los Gigantes

in Cordoba. The invitation for international bids was issued in 1978, and the contract was awarded to Eduardo Sanchez Granel Engineering Projects, on the basis of its highly detailed proposal and the best price offered. The other bidders were: Gardebled-Vialco; Quitralco-Phoenix Laboratories; and Alianza Construction-Alianza Oil.

According to Americo Timonieri, the manager of Geocor, a Cordoban firm handling geological work in the area, the contract requires the contracting firm to produce 100,000 tons of uranium oxide a year. To do this it must mine 700,000 tons of rock a year, of which only 450,000 tons are usable, while the rest is waste material that is discarded. To date, he explained, we have done detailed prospecting of 430 hectares, which has produced positive results, providing an increase in known reserves. Exploration required the drilling of 1,000 wells, each with an average depth of 50 meters, and an investment of approximately $2 million. The mining work done, he added, confirms the prior studies done by the CNEA, and ensures compliance with the contract for the next 15 years. This work also eliminates the mining risk present at the time of bidding.

The entire project, said the firm's director, the engineer Eduardo Sanchez Granel, was conceived by Argentine professionals using Argentine technology. Only the ion exchange plant, made entirely of stainless steel, was built in the United States at a cost of $4 million. The reasons behind this decision, he said, were purely economic and financial, given Argentina's situation in 1980, when the plant was begun. In addition to Sanchez Granel, which has done all of the civil engineering for the project and its general coordination, the Cordoban firm, Geocor, also worked on the construction of the Los Gigantes complex, handling geological work. The project engineering was done by another Argentine firm, Adrem Corporacion Industrial, while the detailed engineering and construction of the ion exchange plant were done by the U.S. firm, Brown & Root Inc.

This complex, one of the largest mining projects undertaken since the promulgation of the Mining Stimulation Law, also required the participation of other private companies, some of which were Argentine and some foreign. Road construction equipment was provided by Macrosa Crothers Machinery, a representative of the Caterpillar American Co and of Astarsa. The trucks for transporting the ore were purchased from Fiat. About 1,200 tons of sulphuric acid a month will be provided by Duperial. This acid will be transported to the plant by tank trucks specially built for this purpose by Gentile Transport, an Argentine-owned firm. The concentration plant's building, whose area

covers over 600 square meters, was built by a Cordoban firm, Pretensa. The construction method chosen, prestressed concrete, was selected because of its speed of construction and the results demonstrated with the use of this method in other industries in Argentina.

Creating a complex like this in the heart of the mountains, at an altitude of 1,700 meters above sealevel, was not easy. They had to build 10 kilometers of mountain roads and 30 additional kilometers of high-country secondary roads. This meant moving about 380,000 cubic meters of rock. A 30-hectare embankment was created for building the plant, entailing the moving of 500,000 cubic meters of soil, enough to build a road 25 kilometers long. Over 3,000 square meters under roof are to be used for housing, offices, laboratories, a factory, shops, and the actual plant itself. A platform of 45,000 square meters was built to install the 12 static lixiviation tanks (this is an intermediate process before reaching the final stage of yellow-cake). There are two sulphuric acid tanks each with a capacity of 2 million kilograms, 10 tanks each with a capacity of 1 million liters, and the ion exchange plant. To guarantee the area's environmental protection, a dam was built for the evaporation of effluents. It measures 20 meters in height and 400 meters in length. The water surface area is 8 hectares. This necessitated moving 600,000 cubic meters of soil.

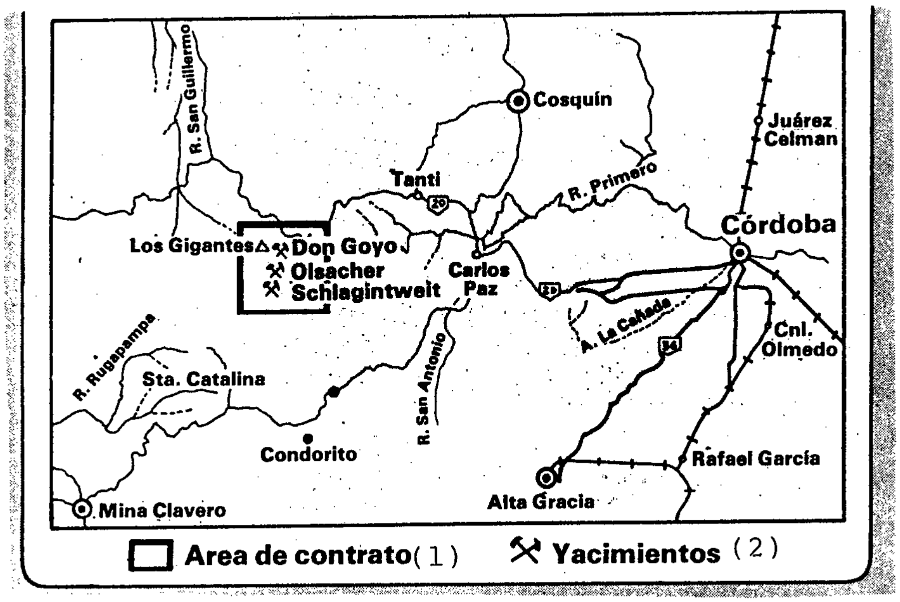
This project, added Sanchez Granel, combined with the plants recently opened by the CNEA in Ezeiza and Cordoba, will allow Argentina to complete the nuclear fuel cycle inside Argentina. Now it will be possible for Argentina to produce fuel elements using Argentine uranium, at a lower cost than the price of imported uranium.

This project, which has both national and international significance, according to Sanchez Granel, will guarantee that Argentina will have control of the nuclear fuel it consumes and technological mastery of this field. This will give us sufficient security to continue introducing design improvements and new developments in the field of nuclear fuels into Argentina.

History of Los Gigantes

The Los Gigantes uranium district covers an area of 625 square kilometers, located in the departments of Cruz del Eje, Punilla, and San Alberto, in the province of Cordoba. The first indications of uranium ore in the area go back to 1957. Some years later, in 1965, the CNEA's geologists discovered "yellow ore," uranium, which led to a detailed aerial prospecting survey.

From 1965 to 1968, an intensive ground prospecting program was conducted in an area of 120 hectares, and preliminary exploration was begun in the "Schlagintweit" field. This documented the continuity of the uranium ore, although it was found to be present at low concentrations, without economic interest at that time. In the middle of 1977, the CNEA resumed its regular exploration of the district, conducting 14,000 meters of drilling, which led to a rapid increase in the reserves of ore considered economically feasible for mining. This led to the decision to offer this area for mining and development to private companies. At the end of 1976, an invitation for bids was issued, and in July 1979 the contract was signed with Eduardo Sanchez Granel Engineering.



Los Gigantes Uranium District

1. Contract area
2. Uranium fields

"We believe that this offers a clear example of reconciling the state's interests--for the state retains ownership of the field, sets the mining quotas, and arranges for the rational undertaking of mining activities in accordance with our nuclear and energy development plans--and the role of private enterprise, which, with the legal system we have in Argentina, has a vast scope for action, providing venture capital and completing the state's activities with the prospect of a certain market and the consequent earnings," explained Eduardo Sanchez Granel.

The Mining Stimulation Law, he added, which does not apply solely to nuclear energy but to almost all of the mining industry, was designed for use in relation to the Los Gigantes mining district, in order to provide benefits such as tax exemptions, exemptions from customs tariffs for some elements that have to be imported, and other advantages that are essential for the development of the mining industry. This sector has very special characteristics because of its high risk and its very expensive initial investments. It encourages the creation of regional poles of development, creates its own resources in very remote areas, and generates new jobs.

7679
CSO: 5100/2012

CONGRESSIONAL INVESTIGATING COMMITTEE RECOMMENDS SAFETY

Sao Paulo O ESTADO DE SAO PAULO in Portuguese 18 Dec 82 p 24

[Text] To insure greater protection for the population, the Congressional Investigating Committee (CPI) on the nuclear agreement yesterday recommended in Brasilia in its final report that atomic powerplants be provided with the necessary safety features "over and above any interest of an economic nature."

According to the conclusions of that CPI, safety should receive the greatest attention in the planning and execution of nuclear powerplant research activities. Moreover, all powerplants should be kept up to date on improvements of safety systems which would include the reduction of the effects of radioactivity in the environment.

The CPI report, prepared by Senator Milton Cabral (PDS-PB [Social Democratic Party of Paraiba]), also recommends that the Federal Comptroller General make an audit of the Angra I Nuclear Powerplant for the purpose of verifying and explaining figures relative to the following items: total cost of the powerplant, with amounts separated into direct and indirect costs, and what is the relative in-increase in cost over the amount contracted for; final cost of the final compensation to Westinghouse because of the transfer of the piping assemblies meant for the Angra I Powerplant to the Itaorna work site; and the amount of the payment made by FURNAS retroactively to the Angra I contractors; increase in the cost of projects due to the addition of supplements to contracts and how much those supplements represent with respect to previous amounts and what was the proportion of the increase considering the rate of inflation.

According to the CPI suggestion, that audit should also investigate the direct cost of the Angra II foundations, clarifying separately the final number and costs of the pilings built, the cost of reinforcement and of the slab over them.

8908
CSO: 5100/2020

SPENDING CUTS WILL NOT AFFECT NUCLEAR FUEL CYCLE PROJECT

Sao Paulo O ESTADO DE SAO PAULO in Portuguese 31 Dec 82 p 22

[Text] Minister of Mines and Energy Cesar Cals said yesterday that the real decline of 40.57 percent in spending by NUCLEBRAS [Brazilian Nuclear Corporations] approved for 1983 is not going to affect the nuclear fuel cycle because it is essential for obtaining that technology for Brazil. Cals said that he will discuss ways of increasing its spending with corporation president Paulo Nogueira Batista.

The minister could not say what the length of the delay will be in the beginning of operation of the nuclear powerplants due to cuts in the NUCLEBRAS budget. He said that "NUCLEBRAS asked for resources for maintaining the same rate of activity in 1983 that it had in 1982. Now, with the cuts, we are going to see how it makes out."

Assistant Secretary of the Ministry of Mines and Energy Antonio Felicio said, in turn, that too much should not be made of the cut made in NUCLEBRAS spending in terms of a reduction in its activities because in 1983 it will be more free of debt. According to him, NUCLEBRAS paid many of its debts this year and the sum of its debts in 1981 is much smaller. He said that NUCLEBRAS received 15 billion cruzeiros from the National Treasury precisely for the payment of foreign debts.

Felico and Cals also could not say how much of NUCLEBRAS spending will be allocated for each of its projects, such as the uranium enrichment plant under construction in Resende, Rio de Janeiro, the nuclear powerplants Angra II and III in Rio de Janeiro and Iguape I and II in Sao Paulo. At the next meeting between Cals and the president of NUCLEBRAS the amounts of money for each of those projects should be established.

8908
CSO: 5100/2020

DELAYS FURTHER POSTPONE OPERATION OF ANGRA 1 TO 1984

Sao Paulo O ESTADO DE SAO PAULO in Portuguese 18 Dec 82 p 24

[Text] Licinio Seabra, president of FURNAS [Electric Powerplants], declared yesterday that the Angra I nuclear powerplant will not go into commercial operation in October next year but at the beginning of 1984 because Westinghouse does not yet have a set time for making the repairs of the preheating systems of the steam generators. With the delay of 2 years, the cost to FURNAS rises to $260 million, an amount which refers only to interest.

Seabra explained that Westinghouse is now preparing the third team of technicians and engineers, with two of them already assembled awaiting authorization from the Nuclear Regulatory Commission (an agency which oversees all nuclear activities in the United States) for initiating repairs of all the nuclear powerplants it has built which show that defect.

In addition to the Angra I nuclear powerplant, other Westinghouse-built reactors, such as that of Rinhals III in Sweden, Almoraz in Spain, Krisko in Yugoslavia, and Mcguire in the United States, show the same defects and cannot operate normally under the risk of venting radiocactive material.

According to Licinio Seabra, as soon as NCR approves the procedures proposed by Westinghouse to fix the defects of its reactors, those three teams of technicians and engineers of the company will go to the countries where they are installed to make modifications. In the case of Brazil, it is expected that repair work will begin in May 1983. Since that work should take a minimum of 5 months, at the end of which final operational tests will begin, Licinio Seabra believes that commercial operations of Angra I will be possible only in the early months of 1984.

Diesel Reactors [as published]

Another problem arising with the diesel reactors of the auxiliary backup system--still not resolved by the U.S. Company, Fairbanks Morse--is also delaying reactor power tests in which FURNAS expected to raise the load of the powerplant to 50 percent or nearly 300 megawatts for the first time. Licinio Seabra still does not know when it will be possible to make those tests under load in view of the successive delays which have occurred. At any rate, the power from Angra I will not be needed for the power system. According to the FURNAS president, there is a large surplus of power.

He emphasized that with the entry into operation of the Itaipu Hydroelectric Plant, it is estimated that the south and southeast regions will have a "firm surplus" of 1.8 to 2 million kilowatts of power for the next 10 years, in addition to the margin of reserve required for insuring the system.

He also said that the foreign debt of FURNAS is $2.7 billion. The 1983 budget has not yet been approved, but Liciaio Seabra said that many projects are already being postponed, among them being that of Sao Felix, the AC circuit from the Itaipu transmission line, and other hydroelectric plants which would have their operations begun next year, so that the company can place itself within the framework of the budget cuts. With respect to debts to construction companies, he said he expects to reduce the balance of 11 billion cruzeiros owed to a maximum of 7 billion cruzeiros by the end of the year.

Ecological Station

FURNAS and the Special Secretariat for the Environment (SEMA) signed an agreement for the installation of an ecological station in the region of the Almirante Alvaro Alberto nuclear powerplant with the aim of protecting the local flora and fauna, performing research on possible changes and protecting the environment.

Pursuant to the agreement, FURNAS takes on the task of watching over and preserving the area located between the Fora do Mamede Beach and Guariba Beach, including Ilha Comprida, and of making available the use of its physical and administrative structure during the phase of installation of the station and to cede, through a specific contract of commodatum, an area it owns to SEMA, an area of 70 hectares located facing the beaches of Mambucaba and Batanguera. FURNAS also pledges to work with SEMA in the development of a program of physics-chemical-bilogical information to serve as a reference for the establishment of future nuclear powerplants.

8908
CSO: 5100/2020

CNEN EXPENDITURES TO INCREASE BY 203 PERCENT IN 1983

Sao Paulo O ESTADO DE SAO PAULO in Portuguese 30 Dec 82 p 22

[Text] Spending by the National Nuclear Energy Commission (CNEN) in 1983 will be 203.94 percent greater than that of this year in real terms, according to the budget of the Special State Company Oversight Secretariat(SEST). The CNEN spent 865.8 million cruzeiros in 82 and in 83 it will spend 3,308,600,000 cruzeiros. Technicians of the Ministry of Mines and Energy explained this phenomenon as being the result of expenses of the CNEN in transferring the Nuclear and Energy Research Institute (IPEN) of Sao Paulo from the state government to its jurisdiction. However, the technicians could not say what the amount of money to be assigned to the IPEN would be nor what increase in spending would be caused to the CNEN by this institute.

NUCLEBRAS expenditures approved by the government for 1983 had a nominal increase of 37.49 percent by comparison with those of this year, but not counting the projected rate of inflation of 78.06 percent next year, they are the equivalent of a real reduction of 40.57 percent. In 82 NUCLEBRAS spent 130,645,600,000 cruzeiros and in 83 it will spend 179,628,600,000.

The other two powerful companies of the electrical sector, ELETROBRAS [Brazilian Electric Power Companies Inc] and Itaipu Binational, will also undergo considerable reductions in their budgets. ELETROBRAS will have a nominal increase of 37.12 percent, which is the equivalent of a real reduction of 40.94 percent because in 82 it spent 448,510,600,000 cruzeiros and in 83 it will spend 615,175,300,000. Itaipu spent 240,333,900,000, cruzeiros this year and in 83 it will spend 336,068,400,000, which represents a nominal increase of 39.83 percent and a real decrease of 38.23 percent.

Of the companies in the energy sector, the least affected by budget cuts was PETROBRAS [Brazilian Petroleum Corporation], since its real decrease will be only .29 percent. Spending by the state petroleum company this year was 740,328,600,000 cruzeiros and in 83 it will be 1,320,425,200,000, the nominal increase therefore being only 78.35 percent.

These expenditures, however, according to the assistant secretary general of the Ministry of Mines and Energy, Antonio Felicio, will not adversely affect the daily petroleum production goal of 400,000 barrels by the end of next year because PETROBRAS will primarily invest in the production sector.

Mining companies were not spared cuts in spending. The Vale do Rio Doce Company (CVRD) spent 248,145,800,000 cruzeiros this year and in 83 will spend 442,015,300,000., which represents a nominal increase of 78.12 percent and a real decline of 0.06 percent. The Mineral Resources Prospecting Company (CPRM) spent 5,889,700,000 in 82 and will spend 7,404,600,000 in 83, which is the equivalent of a nominal increase of 25.89 percent and a real decline of 52.17 percent.

Priority

Assistant Secretary of the Ministry of Mines and Energy Antonio Felicio said that NUCLEBRAS will give priority in 83 to the projects of the fuel cycle, which in the order of strategic importance for the government are the uranium enrichment plant under construction in Resende, Rio de Janeiro, and the uranium processing plants in Itataia, Ceara, and Lagoa Real (Bahia), the two largest uranium reserves in the country.

In second place on the scale of priorities are the construction of the nuclear powerplants Angra I and III in Rio de Janeiro, and Iguape I and II in the region of Peruibe, Sao Paulo. Antonio Felicio could not say, however, how much money will be allocated to each of those projects, explaining that the allocation of funds for the coming years has not yet been done.

In the area of PETROBRAS, Antonio Felicio cited as priorities, in addition to the production sector, changes in petroleum cracking so that more byproducts will be produced from the same barrel of petroleum; better byproducts such as diesel oil and gasoline. In order to accomplish this, according to the technician, PETROBRAS will have to make adjustments in its petroleum refining structure.

8908
CSO: 5100/2020

NUCLEBRAS INVESTMENT BUDGET CUT 80 PERCENT

PY200143 Rio de Janeiro JORNAL DO BRASIL in Portuguese 12 Jan 83 p 21

[Text] Sao Paulo -- A program prepared by SEST [Secretaria Especial de Controle das Empresas Estatais] at the end of 1982 provided for an increase of approximately 60 percent in Nuclebras investments in 1983. Nevertheless, due to the successive cuts which have taken place since November, and especially due to the standby policy on expenditures imposed by the IMF, state investment for the next term will drop by 80 percent in real value.

These estimates were made yesterday by ABDIB [Brazilian Association for the Development of Basic Industries]. In this program, prepared by the ABDIB Economic Division, Nuclebras investments for 1983, including all infrastructure projects and orders of capital goods intended for the Iguape-1 and Iguape-2 plants, will reportedly amount to $213 million, and through the current freeze by the presidency of the republic, was summarily suspended.

ABDIB has not been informed as far as the details of the cuts are concerned, or even as far as the situation of projected investments for 1984 of the Sao Paulo nuclear plants are concerned, which will reportedly amount to $516 million. This organization is also awaiting for the reestablishment of the budgets for the Angra II and Angra III which in 1983 should amount ot $838 million.

CSO: 5100/2026

PROPAGANDA AGAINST PAKISTAN'S NUCLEAR PROGRAM DECRIED

Lahore NAWA-I-WAQT in Urdu 21 Nov 82 p 3

[Editorial: "Opposition of Only Pakistan's Nuclear Program"]

[Text] Pakistan has emphasized in the United Nations that benefitting from peaceful nuclear technology is the basic right of developing countries, too, and they should not be discriminated against in the name of preventing the proliferation of nuclear weapons, since the imposition of unilateral restrictions on them alone cannot stop the proliferation of nuclear weapons. For this purpose, restrictions should be imposed instead on the development of nuclear weapons. The Pakistani ambassador, Mr Shah Nawaz, said this in the United Nations while expressing his viewpoint on the annual report presented by the International Atomic Energy Agency's director general (former foreign minister of Sweden), Mr Hans Blix.

According to this report, there are now five countries that are stockpiling up nuclear weapons, and there are five such countries that, without complete international safeguards, have acquired or are about to acquire so much superiority in nuclear technology that they are capable of manufacturing nuclear weapons. The director general did not name the countries in these two categories, but it is well known that the countries producing nuclear weapons are the United States, the Soviet Union, Britain, France and China. The countries that have acquired this capability and skill regardless of international safeguards are Israel, South Africa, India, Brazil and Argentina. However, for the last 6 to 7 years, the only target of opposition by the nuclear powers, especially the Western countries under the leadership of the United States, has been Pakistan's very limited and peaceful nuclear program. Their frenzied enmity is such that they have even imposed restrictions on undertakings. Even the newspapers of these countries, in the form of mystery stories based on mere fabrications, come up with new innovations and give publicity to the "Islamic bomb."

Mr Shah Nawaz rightfully emphasized that the basic objective of stopping the proliferation of nuclear weapons can be achieved by imposing restrictions on their development, for which political agreement on the international level is essential. However, all of the pressure is on preventing the developing countries from acquiring the capability of nuclear technology. In this way, nuclear technology will be confined to only a few advanced countries, who would establish a monopoly over it for ever. With regard to Pakistan, he said that last year Pakistan had installed additional safeguards suggested by IAEA for the

nuclear plant at Karachi. Prior to this, from time to time the agency has inspected this plant and 70 times during its inspections the agency has declared this plant's safeguards as satisfactory. In light of these factors, he described the propaganda against Pakistan's peaceful nuclear program as extremely misleading and utterly groundless.

The Pakistani Government has several times made clarification on these lines about its nuclear program, but this has not diminished the storm of propaganda against it. The countries stockpiling nuclear weapons are doing so openly. Similarly, everyone knows about the countries that have acquired the capability and technology to produce nuclear weapons. But they are ignored entirely, and Pakistan, and Pakistan alone, is being made the target of criticism. Therefore, it is not wrong for the Pakistanis to think that the nuclear powers are not ready to accept the fact that the Islamic countries, through Pakistan, should be successful in acquiring the capability of producing energy from nuclear technology. In this matter, the extent of their discrimination and narrow-mindedness can be seen in the fact that they do not use for themselves the term Soviet or American bomb, Christian or communist bomb, Israeli or Hindu bomb. Rather, they appear to be the standard-bearers of so-called secularism. Pakistan's nuclear program, however, is referred to as an "Islamic bomb." In other words, the target of their opposition is not only Pakistan's nuclear program but the basic right of the entire Islamic world. The Islamic world should examine from a similar standpoint the Western countries' frenzied and wisked opposition to Pakistan's nuclear program, and they should challenge it united. It can be said with full confidence that if the other Islamic countries regard the Western countries' baseless and misleading accusations against Pakistan's nuclear program as opposition to themselves, the storm of unilateral propaganda against Pakistan would subside.

9779
CSO: 5100/4310

PROGRESS OF NUCLEAR MEDICINE DISCUSSED

Karachi DAWN in English 13 Dec 82 pp 5, 6

[Article by Munir Ahmed Khan]

[Text] THE general standards of public health in Pakistan are still well below the desired level. That is why the Government has given priority to the expansion and improvement in medical facilities.

Although we still need a large number of additional hospitals for providing conventional basic facilities, yet we cannot afford to ignore the introduction of latest medical techniques in the country including the most advanced radiation techniques. The pattern and frequency of certain malignant and other diseases in our part of the world are such that application of nuclear techniques has special significance for us in providing cure and diagnosis. For instance, we have incidences of diseases of liver, thyroid, kidney, lung and other organs and cancer which cannot be diagnosed and treated easily and effectively with conventional methods.

The radioisotope techniques are now being increasingly employed as these have established certain distinct advantages over the conventional methods. Diagnosis and investigations through radioisotopes, for instance, are not only easier to perform but also have far greater accuracy. In many cases it eliminates the need for surgery which is unavoidable in the diagnosis of diseases in underlying tissues. In diseases, like goitre, radioisotopes provide the surer means of diagnosis. Radioisotope techniques are especially helpful in determining the cause of hypertension due to kidney failure. Sometimes hypertension is caused when one of the kidneys develops a disorder and stops functioning properly. The use of X-rays is not always effective in diagnostic work whereas scanning with the help of radioisotopes is more reliable. It can for instance determine whether high blood pressure is due to kidney trouble or otherwise

which is not easy to diagnose with X-rays. In fact, there is hardly any system in the human body nor is there any field of medicine where isotopes are not needed to play an important role in diagnosis, treatment and research.

The proper administration of radioactive isotopes enables a doctor to probe almost any part of human body and diagnose the exact location of the diseased area and the extent of damage to the tissues involved. Apart from their use in diagnosis, nuclear techniques are equally applicable in therapeutic work. Radiations, for instance, are very effective in killing cancerous cells or destroying sufficient amount of tissue in an hyperactive gland and make it function normally.

Treatment of cancer depends upon selective killing or removing of the cancerous tissue. For killing cancerous cells either radiotherapy or chemotherapy is used, whereas surgery is used to remove cancerous growth. In many cases a combination of treatment like surgery followed by radiation gives better results. The modality of treatment is decided by the doctor, taking into account the condition of patient, the nature of the cancer, and other relevant factors.

Radiation alone or in combination with other methods is generally the treatment of choice and is used in the treatment of majority of cancers. An ideal type of radiation for cancer treatment would be the one which would deposit all its energy at the site of the malignancy no matter where it is located. Unfortunately no sucy radiation is available. The next best is to have radiation which has (i) smaller specific absorption in bone compared with soft tissue (ii) increased percentage depth does (iii) decreased side scatter and (iv) skin sparing effect.

To achieve the above objectives an ideal machine would be an high-energy electron accelerator like linacs or betatrons specially in cases of large patients and in cases where size, shape or location make it dificult to treat by any other method. About 80-90% ofthe cases, however, do not need such sophistication and can be treated with radiation from a Cobalt - 60 machine or X-ray machines. Because of the ease of handling and maintenance so far only such machines have been provided by Pakistan Atomic Energy Commission at some of its medical centres. However, to cater for 10-15% of the cases which cannot be easily treated by the Cobalt - 60 machine the Commission has arranged to provide linear accelerators at its two new medical centres at Lahore and Islamabad. In addition, the Commission has also provided facilities for interstitial and interacavitary radiotherapy for the treatment of interstitial and other gynaecological cancers. Radionuclides are also being used in the form of injections or oral medication to act at the diseased part of the body.

The first radiopharmaceutical to be widely used was iodine-131 in the form of Sodium Iodide salt. Its use as a diagnostic test for certain thyroid disorders was established in the late 1940's. As the drug could be administered orally, it was sometimes called "atomic cocktail". This facilitated the widespread use of radioisotopes for diagnosis, investigation and this therapy of several human illness has increased in many countries.

The first nuclear medical centre in Pakistan was established in Karachi in 1960. It was followed by similar centres at Lahore, Multan, Jamshoro and Larkana, the country's largest nuclear medical centre called IRNUM (The Institute of Radiotherapy and Nuclear Medicine) was formally inaugurated at Peshawar six years ago. These centres not only carry out diagnosis and treatment of various diseases and some non-cancerous conditions with radiation and radioisotopes but also train doctors and technicians in the latest techniques of radiotherapy and nuclear medicine.

In addition, research work is also being carried out at these centres to determine the causes and possible remedial measures for certain types of unconventional diseases found in different parts of the country. The centres have great importance because they show the humane and positive side of nuclear energy. They have a great social impact as they demonstrate that nuclear radiations, when applied in a controlled manner provide relief to suffering humanity. PAEC thus has undertaken a programme of setting up of nuclear medical centres in the country to demonstrate the beneficial aspects of nuclear radiation.

IRNUM, Peshawar

The need for setting up this centre was felt after it was discovered that certain types of cancers and other malignancies were predominant in the Frontier region than anywhere else in the country. It was also needed to provide a firm base for carrying out basic research in determining the causes and possible preventive measures against cancer and such other diseases. IRNUM is the first centre of its kind built by the Commission in Pakistan which has facilities for providing indoor treatment to deal with serious cases. It has 36 beds including rooms for advanced cancer patients and adequate provision of separate beds for children. Construction work on additional 36 beds has started, which is expected to be completed soon.

The Institute has two major units; the nuclear medicine and radiotherapy section. The radiotherapy section is equipped with four radiation sources namely; Cobalt-60, Caesium 137;Deep X-ray and Superficial therapy machines. It also has a unique facility called a Simulator. This machine is not available in any other nuclear medical centre in the country and is used to determine the exact location of the tumour. It is backed by a first class pathological lab which in addition to conducting research provides services for tissue and other biomedical analyses.

The nuclear medicine section of IRNUM is concerned mainly with the diagnosis and treatment of those diseases which are amenable to radioactive isotopes. The section is well equipped with two gamma cameras, rectilinear scanner, thyroid uptake probe, renography equipment and various types of gamma counters for radioimmunoassay work.

Another nuclear medical centre at Islamabad will be operational in about a year's time. The centre will be the largest of its kind in the country and have facilities of 75 beds for indoor treatment. Equipped with most sophisticated machines, this centre in the Federal Capital will have for the first time in Pakistan a machine called linear accelerator for the treatment of deep seated tumours. Costing about Rs 5 million in foreign exchange the rays from this machine can penetrate deep into the skin without burning the skin or adjoining tissues. A similar equipped centre called Institute of Nuclear Medicine & Oncology, Lahore is under construction in the premises of Sheikh Zaid Hospital, Lahore.

A large number pf patients are diagnosed and treated every year at PAEC Medical Centres. Last year nearly 30,000 new patients were registered and 40,000 followup cases were attended at these medical centres. Thus a total of 70,000 patients visited nuclear medical centres in the country for diagnosis and treatment. The number of patients attending these centres is a small fraction of the total number of patients needing such services. This is primarily due to lack of awareness in doctors and

patients about the usefulness of nuclear medicine and oncology.

In order to increase the awareness the Commission is providing specialist services to medical colleges for teaching courses in the field. Help is also taken from radio, T.V. and press in publicising the scope of these branches of medicine. As a result, there has been a steady increase of patients being referred to Commission's medical centres.

The Commission's nuclear medical centres have also provided training facilities to doctors, postgraduate medical students, radiologists and PAEC Personnel. At the Lahore Medical Centre alone about 300 doctors and Radiobiologists have so far been given courses in nuclear medicine and techniques.

In addition to routine clinical work, these medical centres are also actively engaged in research studies on diseases prevalent in the area. Some research projects have already been completed in collaboration with the IAEA. A detailed study in the endemic goitre in north west frontier regon has been completed and reports submitted to the Federal Government. The NWFP Government is now actively taking up the preventive programme in the light of recommendations made by PAEC experts. In the field of cancer research, a study on 500 cases of cancer in the Frontier Province has been completed in collaboration with Pakistan Medical Research Council.

Some revealing and interesting observations have been made according to a study recently launched at IRNUM. According to this study, incidence of bone and Desophagus (feeding tube) cancer among the males of Frontier Province is 8.8% and 6.4% respectively. Lips and lungs cancers in this region are reported to be 2.8% and 5.18% respectively. These figures may be compared with the corresponding figures in U.K. The incidence of bone and desophagus cancers in U.K. is 0.9% and 1.84% while that of lips and lungs is 0.65% and 29% respectively among males. These figures point towards causative elements in the environment and will prove useful in ultimately knowing the causes and possible remedies against cancer.

In view of the increasing application of radioisotopes in nuclear medicine, it is necessary to locally produce radioisotopes so that they are readily available for nuclear medical centres. Realising this the PAEC set up a Radioisotope Production Laboratory at its leading research establishment, the Pakistan Institute of Nuclear Science and Technology in Islamabad. It produced its first batch of radioisotopes consisting of Sodium-24 and Potassiu-42 in 1967. Today it produces Iodium-131, Tc-99, Au-198, Sodium-24, Potassium-42, Iron-56 and number of other isotopes and their labelled compounds. A significant portion of the radioisotope requirements of nuclear medical centres is being met through local production. It is hoped that the PAEC medical centres would soon become mostly self sufficient in their requirements of most of the radioisotopes in near future.

CSO: 5100/4322

KEEN INTEREST IN CHASHMA PROJECT DISCUSSED

Karachi DAWN in English 12 Dec 82 Supplement pp I, IV

[Article by M. Ziauddin]

[Text] THREE COUNTRIES, West Germany, Belgium and Switzerland are said to have evinced keen interest in the tenders floated by Pakistan on December 1, this year, inviting international bidders and various qualified suppliers for the construction of a 900MW nuclear power station at Chashma, 170 miles from Islamabad.

Knowledgeable circles attribute the quick response to the acute and continuing depression in the world nuclear market. They say, for the last five to seven years the West European suppliers of nuclear power plants have been facing a marked decline in demand and therefore have had to curtail their operations drastically. This, in turn has had a pronounced adverse impact on the economies of West European supplier countries.

These countries had crashed into this market in the early seventies by committing staggeringly huge capital in the hope of cashing on a fast developing demand and in the process regaining their economic strength which was suddenly weakened by the oil crisis.

However, by the late seventies this projected demand had considerably slackened and the supplier countries were forced to readjust their programmes at a very high cost. Independent nuclear experts of Pakistan believe that the demand slackened in the spin-off of a clash of economic interests between USA, which just a few years ago had acquired the monopoly of world nuclear fuel supplies, and European suppliers of power plants who were also offering the technology of fuel fabrication and resprocessing in the package.

Apprehending that the fuel market would slip out of its hand completely, if those countries lacking nuclear technology were to acquire the capability of operating their plants with home made fuel, the USA, in the opinion of experts, brought political pressure to bear on West European suppliers and tried to stop them from passing nuclear fuel processing technology to the Third World.

These experts believe that the factor of public opinion which is becoming increasingly anti-nuclear in West European countries was also partly responsible for curtailing of commercial nuclear activity in that part of the world.

The quick response of three West European nuclear suppliers to Pakistan's invitation is regarded by these experts as an indication that the European suppliers have refused to buckle under US pressure. In the past too, despite US disapproval, France sold a complete nuclear cycle project to Japan while West Germany supplied a similar plant to Brazil.

Recounting Pakistan's own nuclear programme history, these experts said that because of the clash of economic interests between US and the West European nuclear suppliers, this country's peaceful nuclear programme has suffered a great deal. As a consequ-

ence, they said, Pakistan will face an acute energy crisis by 1990.

Energy experts said that our conventional energy resources were very limited. They said, though hydro power was our major resource at the moment, it had constraints both due to the total amounts available and the rate and location at which it could be exploited. Most of the hydro resources are concentrated in the north and require high transmission costs to utilise the power generated at the load centres.

As the most favourable sites have already been exploited, the cost of constructing dams at new locations, most of which are in the siesmic region, is becoming very high. Nevertheless, in the opinion of these experts, from technological and economic points of view we can exploit only 40 per cent of this resource and thus hydro could provide about 30 per cent of the installed capacity requirement.

Talking of coal they said, the coal in Pakistan was not only limited in quantity but most of it was lignite and thus poor in quality and difficult to use for power production. And, Countrary to the general belief, they added, gas reserves in Pakistan were not very larged and would continue to be used for other valuable purposes. Moreover, Gas, they said, was an important raw material and was needed in the manufacture of fertilisers and petrochemicals. In addition, there is its domestic use and we could not afford to burn it for power production.

Energy economists agree with this assessment. They said our total coal desposits, proven and probable, amounted to 437 million tons but when reduced to good quality coal, it corresponded to only 173 million tons. This may be compared with 81 billion tons of coal reserves in India.

With regard to gas, they said, our reserves of 26.4 million cubic feet corresponded to 724 million tons of coal and unless new discoveries are made our gas will be fully committed by 1988.

The oil situation is also not very happy. We are importing nearly 90 per cent of our oil requirement at a cost now of 1.6 billion dollars which is estimated to go up to around 6 billion dollars by 1990. Oil economists insist that even after the exploitation of full potential of Khaskheli and Dhodak we will have an unbearable strain on our economy to further increase the cost of import of oil by using it for power generation on a large scale.

Besides, oil has several other important uses and it is not optimally economical to burn it for power production, they added. In this regard, they declared, it should be noted that even those countries which have surplus oil reserves were turning to nuclear energy to meet their power demands.

And finally, they said, even if we succeed in striking indigenous reserves of oil we will have to depend upon other more economical sources of power in view of the growing consumption of oil and its increasing prices.

Independent economists give full credit to Pakistan Atomic Energy Commission for taking in hand a comprehensive nuclear programme at a very early stage. The 137 MW KANUPP plant is the product of the Commission's planning which began as far back as 1961. The ECNEC approved the plan in 1964 and the turn-key contract was signed with the Canadian General Electric Company in 1965. Construction work on the plant began in 1966 and the project was completed by the middle of 1971 and commissioned in 1972.

After this first step, the Commission chalked out an elaborate but economically realistic nuclear programme. The goal was to generate by the end of the century 30 per cent of total electric power generation in the country or 5500 MW, out of 18000MW, through the nuclear source. In this connection it was planned to build a 500 mw station in the North and another dual-purpose plant with a nominal output of 400 mw and 100 million gallons of fresh water per day at Karachi.

The tentative target for the completion of plant in the North was 1979, the dual-purpose plant was to be completed in 1982-83. After 1985 the country was to start building a series of nuclear plants with capacities ranging from 500 to 700 mw at relatively short intervals to keep pace with the growing demand in the country.

Simultaneously, the Commission had begun exploring the possibility of acquiring fuel production capacity. Explaining the reasons why we needed this capacity Dr. Munir Ahmed Khan, Chairman of

Pakistan Atomic Energy Commission told a gathering of Pakistani engineers in 1979 that "a power reactor normally burns on to three per cent of uranium after which, because of fission products produced in the fuel, the reactor loses its ability to sustain chain reaction. The burnt fuel is, therefore, discharged and fresh fuel added. We can reuse this discharged fuel provided we remove the poisonous fission products and clean up the uranium and separate plutonium which is produced in the reactor. A processing plant is used to perform this operation."

Search for uranium

At about the time, the possibility of setting up a reprocessing plant was being studied, Pakistan started prospecting for uranium. Actual drilling work began near Dera Ghazi Khan under a UNDP financed project. Soon the efforts began yielding results. If the D.G. Khan reserves add up to 5000 tons of uranium it would be sufficient for meeting our power requirements for a long time to come, said a nuclear scientist.

The PAEC's nuclear programme also included the setting up of a fuel fabrication plant which came on stream in 1980. This enabled Pakistan to meet the emergency that occurred when the Canadians put an embargo on the supply of nuclear fuel and spare parts to KANUPP in December 1976.

However, the entire nuclear programme of Pakistan was jeopardised when France broke its agreement to supply a nuclear reprocessing plant. The nuclear power plant which was to be set up in the North was affected most, because civil work on this plant located at Chashma was reportedly completed on schedule. Activity on the project was slowed down considerably in later years because of ensuing uncertainty. It may be recalled here that, meanwhile, the power generating capacity of the proposed plant had been increased to 600 megawatt.

Progress despite reverses

Despite the reverses, the Pakistan Atomic Energy Commission continued to proceed with the planning for the project and kept up its search for adequate financial and technological resources for completing it. Finally, after having increased the generating capacity of the proposed plant to 900 mw, in view of the time lost and the difficulties expected to be faced in implementing the earlier comprehensive programme of locating a number of power stations at various places in the country by 1990, the Commission reportedly approached the International Atomic Energy Commission for their approval to invite bids for construction of the plant. It is of interest to note that the Chashma plant is comprehensively covered by all the safeguards of the IAEC.

Independent nuclear scientists have expressed their satisfaction over the condition of the tenders that bidders should give a five year supply of fuel initially as a part of the package and also enter into contract for another 15 years beyond five years for the supply of material and components including uranium. They also noted with satisfaction the fact that Pakistan will negotiate for arranging uranium from the domestic resources and ask for enrichment facilities.

CSO: 5100/4322

NEED FOR ATOMIC ENERGY STATED STRONGLY

Karachi JANG in Urdu 9 Dec 82 p 3

[Editorial: "Nuclear Technology and Pakistan"]

[Text] While addressing a gathering of Pakistanis in Washington, President Zia ul Haq stated that Pakistan is not engaged in any program for the development of nuclear weapons. However, he said emphatically that Pakistan intends to obtain nuclear power in order to remove its energy deficiency. He announced that, "If nuclear technology is not transferred to us peacefully, we will obtain it by force." He said that it is the birthright of all nations, and especially of developing nations, to obtain new technology. He said that it is the birthright of all free countries to have research programs for peaceful purposes, and no one can deprive them of this right. So far as Pakistan is concerned, President Zia ul Haq said that we have a shortage of energy resources. We need electricity and we are building a dam for this purpose, but this does not fill our electricity needs. We have some oil also, but all these resources are only able to fill 20 percent of our needs. The remainder of our needs we fill by importing oil, and this costs us 16 million dollars, which is half the amount Pakistanis overseas earn by their blood and sweat. That is why we are trying to fill this deficiency by means of nuclear energy.

President Zia ul Haq has expressed Pakistan's energy and fuel needs in a very reasonable manner. This is the kind of obvious reality which no patriot can deny. According to expert estimates, Pakistan's own energy resources, which are not in excess of 20 percent, will gradually become less, while the need for electricity and energy will increase, because in today's scientific age no nation can continue to exist without energy resources. The light of modern science and nuclear technology are essential to stop the darkness of poverty, ignorance, unemployment and backwardness. President Zia ul Haq was correct in saying that Pakistan will obtain this new technology at any cost. This is the resolve and intention of the entire Pakistani nation. Nuclear technology is necessary for our national survival. If this technology is not transferred to us peacefully through our entreaties, then we will not refrain from obtaining it by force if necessary. This expression of the country's firm resolve before the Pakistanis residing in America was an important necessity of the time. The entire nation speaks with one voice on this issue.

This is an issue about which there are not two views in the country. The entire nation is united and in agreement.

The President has made this announcement in Washington at a time when the leaders of America and Pakistan are engaged in the highest level talks. Certainly Pakistan's nuclear policy and the hostile propaganda on the American side will also come under discussion. President Zia ul Haq has proved by his irrefutable arguments that Pakistan has no interest in building a nuclear weapon, so the propaganda about a so-called Islamic bomb is just mischief-making. In this situation, the American authorities should think seriously about Pakistan's energy needs, and supplying a better substitute. On the one hand the American President Reagan expresses concern over the safety of Pakistan in the face of danger, and gives lip service to serving the humanity of Pakistan, and assures us that friendship and understanding between Pakistan and America are increasing day by day; and on the other hand, so far as the effort Pakistan is making to come out of the darkness of poverty, backwardness and ignorance and set forth on the road to the goal of culture and progress by obtaining modern nuclear technology is concerned, the American government is not only putting obstacles in the way but is also pressuring other countries to prevent the peaceful transfer of nuclear technology to Pakistan. We want to make it clear to the American government that without remedying their conflicting and two-faced policy they cannot truly obtain the friendship, support and goodwill of the Pakistani people.

9914
CSO: 5100/4320

OVERREACTION TO ATTACK ON NUCLEAR STATION FEARED

Johannesburg THE CITIZEN in English 27 Dec 82 p 6

[Editorial]

[Text]

WE AGREE with the Minister of Energy Affairs, Mr P T C du Plessis, that South Africans should not over-react to the African National Congress attack on the Koeberg atomic power station.

Nothing would suit the ANC better than if Capetonians became hysterical about talk of a "melt-down" at Koeberg that, according to a university physicist, could result in the death of 350 000 people in and around the city.

There has been controversy enough over safety measures without a kind of doomsday approach as a result of the ANC attack.

That there was no atomic material on the site at the time may or may not have been known to the ANC.

That the ANC will try to attack the power station again, even when there is atomic material on the site, is more than a remote possibility.

Capetonians of all colours must now appreciate what an unscrupulous and callous organisation the ANC is, since atomic power plants should not be a target for any attack because of the great destruction of life an atomic leak could cause.

The attack, thank goodness, has alerted the authorities to security inadequacies at the plant before the power station is activated.

It is not enough for Escom to say that thousands of people are working at the site and it is not possible to keep check on all of them.

That is an admission of defeat.

What is essential is that Koeberg be made terrorproof; that security arrangements are so tight that ANC terrorists cannot enter the power plant and place explosives inside it at any time, during or after the construction of the plant.

After the ANC attack, Mr Du Plessis announced that an investigation had been ordered into security measures at Koeberg; he gave an assurance that the commissioning of Koeberg "will not be effected at the risk of public safety."

He also emphasised that when the plant became operational, only strictly screened operators would be allowed on the site.

Mr Roger Hulley, the Progressive Federal Party Member of Parliament for Constantia, who is not known for exercising care when making statements on matters of national importance, immediately launched a "Delay Koeberg Campaign."

He labelled Mr Du Plessis' statements as "inadequate" and said: "The public has a right to complete protection from even a remote risk of an incident which could cause a release of radiation so close to Cape Town.

"Now that it has been demonstrated that the security of Koeberg has been penetrated during the construction phase, it would clearly be irresponsible to activate Reactor Number One on schedule early in the New Year while construction activities are in progress."

"The Delay Koeberg Campaign" will include a petition and information meetings.

The trouble with this kind of campaign is that it rouses public emotion and fears at a time when the matter should be discussed calmly and without undue alarm being created.

Mr Du Plessis has repeated his earlier assurance that Koeberg will not be commissioned at the cost of public safety.

It is a promise that must be kept — and we are sure it will be.

CSO: 5100/13

PLANNED POWER PLANTS UP TO 1989 LISTED

Duesseldorf ATOMWIRTSCHAFT-ATOMTECHNIK in German Nov 82 p 592

[Article: "Planned Start-Ups of Power Plants in the FRG Beginning with 1982"]

[Text] The compilation of planned start-ups of power plants in the FRG, based on information from the Association of the Power Industry (VIK), contains information for the years 1982 to 1989 in tabular form. In this, however, one must take into consideration that probably not all projects will actually go into operation on the planned start-up dates given by the operators.

For further tabulation of start-ups planned for the period after 1990, we are dealing, just as in this compilation, in any case for the hard coal power plants listed here, with sites selected so as to be on the safe side.

Start-Up Planning, 1982-1989

Owner/Operator	Power Plant[1]	Capacity (megawatts electric	Type of Fuel[2]
1982			
STEAG/RWE [Steinkohlen Elektrizitaets Westfaelisches Elektrizitaetswerk A.G., Hard Coal Electricity Corporation/Rhine Westphalia Electricity Works, Inc.]	Voerde A	707	S
GKM [Grosskraftwerk Mannheim, Mannheim Power Company]	Mannheim-Neckerau	475	S
EW Mark [Elektrizitaetswerk Mark, Mark Electric Power Plant?]	Elverlingen	315	S

Saarbergwerke [Saar Mines]	Voelklingen	230	S
	1982 total S	1,727 1,727	

1983

HEW/NWK (HES (expansion not known)/Neckarwerke Kernkraft, Neckar Nuclear Power Plants]	Kruemmel	1,316	K
Saarbert [Badenwerk/Bayernwerk/ EVS [Saar Mines/Baden Plant/ Bavaria Plant/EVS (expansion not known)]	Bexbach	750	S
CWH [Chemische Werke Huels, Huels Chemical Plants?]	Marl	130	S[3]
	1983 total: K	2,196 1,316 880	

[1]HWK = power plant for heating service; GT = gas turbines
[2]B = brown coal; E = natural gas; G = blast furnace gas'
H = heating oil; HEL = heating oil EL; I = imported coal;
K = nuclear energy; M = garbage; P = pumped storage
R = refinery gas; S = hard coal; W = water power
[3]and chemical residues

1984

RWE/Bayernwerk [RWE/Bavaria Plant]	Gundremmingen	1,310	K
Preag/Interargem [Preag?/Interarbeitsgemeinschaft, Preag/ Inter Association?]	Grohnde	1,361	K
Badenwerk [Baden Plant]	Karlsruhe	550	S
VEW BVereinigte Elektrizitaetswerke Westfalen AG, Consolidated Electric Power Plant, Inc]	Gersteinwerk	765[4]	S/E
STEAG	Luenen	110	S
BKB [Braunschweigische Kohlenbergwerke AG, Brunswick Mines, Inc.]	Offleben	350	B

[4]Including gas turbine.

	1984 total	4,446	
	K	2,671	
	S	1,425	
	B	350	
1985			
RWE/Bayernwerk	Gundremmingen	1,310	K
Badenwerk/EVS [Baden Plant/EVS, expansion not known]	Philippsburg II	1,362	K
Preussag/RWE	Ibbenbueren	770	S
Isar-Amper	Zolling-Anglberg	450	S
STEAG/RWE	Voerde B	707	S
Neckarwerke [Neckar Plants]	Altbach	460	S
	1985 total	5,059	
	K	2,672	
	S	2,387	
1986			
RWE	Muelheim-Kaerlich	1,308	K
VEW/EW Mark	THTR Hamm-Uentrop	308	K
GFA [expansion not known]	Erlangen	750	S
STEAG	HKW Herne	747	S
Bewag [Berliner Kraft und Licht, AG, Berlin Power and Light, Inc.]	Berlin-Ruhleben	300	S
	1986 total:	3,413	
	K	1,616	
	S	1,797	
1987			
NWK/HEW	Brokdorf	1,365	K
RWE (70%)	Kalkar	308	K

Stadtw. Krefeld [Stadtwerk Krefeld, Krefeld Municipal Power Plant]	Krefeld-Rheinhafen	300	S
Bewag	Berlin-Ruhleben	300	S
STEAG/VEW	Bergkamen B	747	S
STEAG	Walsum	375	S
	1987 total	3,330	
	K	1,608	
	S	1,722	

1988

Bayernwerk/Isar-Amper BAG/Stadtw. Muenchen [Bavarian Plant/Isar-Amper Bayernwerk AG, Isar Amper Bavarian Plant, Inc.?/ Stadtwerk Muenchen, Munich Municipal Power Plant]	Ohu/Isar II	1,369	K
STEAG	Dorsten A	747	S
TWE	Neurath	600	B
RWE	Huerth (Goldenbergwerk [Golden Mine])	600	B
	1988 total:	3,316	
	K	1,369	
	S	747	
	B	1,200	

1989

VEW/EW Mark	Lingen/Emsland	1,303	K
Stadtwerk Duesseldorf [Duesseldorf Municipal Power Plant]	Duesseldorf-Lausward	300	S
Stadtwerk Krefeld	Krefeld-Rheinhafen	300	S
RWE	Neurath	600	B

RWE	Huerth (Goldenbergwerk)	600	B
	1989 total	3,103	
	K	1,303	
	S	600	
	B	1,200	

See also ATOMWIRTSCHAFT, Vol 26, p 622 (November 1981).

5586
CSO: 5100/2527

RESEARCH MINISTRY'S NUCLEAR ENERGY ALLOCATION PUBLISHED

Duesseldorf ATOMWIRTSCHAFT-ATOMTECHNIK in German Nov 82 p 590

[Article: "FRG Government Expenditures for Nuclear Energy for Fiscal Year 1983"]

[Text] Federal Government expenditures for research and technology constitute approximately 90 percent of government nuclear research expenditures in the FRG. Total Federal Government expenditures for nuclear research, amounting to DM 2.159 billion, break down into: DM 960.8 million for nuclear research centers; DM 196.8 million for reactor safety and radiation protection; DM 571.8 million for reactor development, including DM 253.5 million for the SNR-300 and DM 232.0 million for the THTR; DM 290.5 million for waste management and fuel element development; DM 99.5 million for uranium enrichment and storage; and DM 39.5 million for contributions to international organizations. These total expenditures are borne, in addition to the BMFT [Federal Ministry for Research and Technology], by the Federal Ministry of the Interior (BMI) in the amount of DM 68.8 million for reactor safety and radiation protection and by the Federal Ministry for Economics (BMWi) in the amount of DM 58.0 million for safeguarding and final storage of radioactive wastes through the PTB [expansion not known]. The BMI has estimated DM 0.4 million of income through repayment of the loan for the Essen power plant school, and the BMWi DM 150.0 million of advance payments by the future users of the final storage for radioactive wastes. As a result of these revenues the net expenditures of the Federal Government for nuclear research in 1983 are reduced to DM 2.008 billion.

The following table shows important expenditure items in the area of responsibilities of the Federal Minister for Research and Technology in the plan for 1982, as compared with the projected amounts for 1982 and the actual results for 1981.

See also ATOMWIRTSCHAFT 11/81, p 619.

Important Expenditure Items (in millions of DM)* for Support of Areas [listed]		1983 (projected)	1982 (projected)	1981 (actual)
Support of reactor development		571.80	437.00	393.00
	Total Costs			
THTR-300	3,000.00			
HTR--further development	1,065.20			
SNR-300	5,407.40			
SNR-further development	363.50			
SNR--safety design	27.00			
Research reactor, low enrichment	30.00			
	9,893.10			
Of this total sum, the Federal Government provides in 1981:	571.80			
Reactor safety and general reactor safety engineering		128.00	130.40	103.88
Uranium enrichment, R&D		37.00	40.50	39.14
Uranium enrichment, capital expenditures		62.00	58.00	51.81
Fuel element development, waste management, R&D		73.00	72.50	57.66
Fuel element development, waste management, capital expenditures		159.50	112.40	77.56
Basic nuclear physics research, planned research		55.00	52.00	50.05
Basic nuclear physics research, capital expenditures		30.50	28.50	28.57
Non-nuclear energy research		705.50	738.30	616.08
Share of operating costs, Karlsruhe Nuclear Research Center, Ltd (KfK)		359.91	345.31	320.30
Share of operating cost, Juelich Nuclear Research Installation, Ltd (KFA)		294.45	282.07	260.84
Share of operating cost, Max Planck Institute for Plasma Physics, Garching (IPP)		53.58	51.00	45.49

*Last digit is rounded off

Share of operating cost, GKSS--Geesthacht Research Center, Ltd.	60.12	54.25	55.41
Share of operating cost, German Electron Synchrotron, Hamburg (DESY)	92.84	87.12	78.96
Share of operating cost, Company for Heavy Ion Research, Ltd, Darmstadt (GSI)	51.54	48.36	44.55
Share of operating cost, Berlin Hahn-Meitner Institute for Nuclear Research, Ltd (HMI)	49.96	47.13	44.83
Share of operating cost, Company for Radiation and Environmental Research, Ltd, Munich (GSF)	83.10	79.40	73.00
Capital expenditures, Karlsruhe Nuclear Research Center, Ltd (KfK)	99.63	88.60	94.47
Capital expenditures, Juelich Nuclear Research Installation, Ltd, (KFA)	52.90	46.03	52.70
Capital expenditures, Max Planck Institute for Plasma Physics, Garching (IPP)	22.00	13.75	12.80
Capital expenditures, GKSS--Geesthacht Research Center, Ltd	18.19	18.72	24.65
Capital expenditures, German Electron Synchrotron, Hamburg (DESY)	40.00	40.00	40.90
Capital expenditures, Company for Heavy Ion Research, Ltd, Darmstadt (GSI)	18.44	18.55	18.94
Capital expenditures, Berlin Hahn-Meitner Institute for Nuclear Research, Ltd. (HMI)	34.15	25.17	16.45
Capital expenditures, Company for Radiation and Environmental Research, Ltd, Munich (GSF)	17.45	14.19	16.81
Contribution, Max von Laue-Paul Langevin Institute, Grenoble (ILL)	28.65	27.94	25.24

Contribution, European Center for Nuclear Research, Geneva (CERN)	209.58	189.98	169.77
Contribution, International Atomic Energy Agency, Vienna (IAEA)	24.65	22.04	21.31
Contribution, European Company for Chemical Processing of Irradiated Nuclear Fuels, Mol (Eurochemic)	14.80	14.19	12.01
Exchanges of scientists with foreign countries	7.50	7.50	7.04
Research planning	2.45	2.30	2.02
Technology transfer	9.90	9.44	9.05
Scientific cooperation with foreign research institutes	9.00	10.00	10.00

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GOVERNMENT EXPENDITURES IN RESEARCH, TECHNOLOGY LISTED

Duesseldorf ATOMWIRTSCHAFT-ATOMTECHNIK in German Dec 82 pp 644-645

[Article, file No DK 539.1.1002 (430.1) by Dr W. Gries: "Statistics on Government-Supported Nuclear Research in the FRG"]

[Text] Big discrepancies can frequently be found in data on government expenditures for nuclear research and technology in the FRG. This is usually the result of differences in categorizing the support funds, since items which are nominally in the nuclear category, e.g., expenditures for nuclear research center, usually contain considerable amounts of non-nuclear components. Governmental net expenditures for nuclear research and technology are considerably smaller than the overall figures, as becomes especially apparent in analyzing government expenditures for nuclear research centers.

FRG government support for nuclear research and technology is frequently represented in the context of funds which are nominally used for this purpose. This causes considerable problems, because:

--the categorization of individual budget items for nuclear research and technology often occurs in a haphazard manner;

--one German mark of 1957 and 1958 is not comparable in value with a 1980 German mark, unless cost increases for the intervening period are included in the calculation;

--planning figures and actual figures are frequently totaled, in the absence of other figures.

For all these reasons, the data on the extent of governmentally supported nuclear research and technology show considerable variation depending upon the way they are categorized. Thus official statistics indicate that during the period 1956-1979 the total amount spent on nuclear research and technology, including basic nuclear research, reached DM 25.6 billion.[1] Nuclear power research is only a small subheading of this. If we were to accept the data for energy research programs of the Federal Government,

we arrive at an overall expenditure for nuclear energy research during that period of DM 13.9 billion.[2] This always includes nuclear fusion, which however in other official statistics comes under the heading of "new energy sources." In considering expenditures for nuclear energy research from 1981 to 1983 on the basis of different budget plans, the total for nuclear energy research, according to this definition, is DM 18.4 billion from 1956 to 1983. A breakdown of these expenditures according to different subject areas of energy research is shown in the individual nuclear programs, though here too we find some arbitrary categorizations. We must therefore consider the expenditure of DM 18.4 billion for nuclear energy research, including nuclear fusion, as being the upper limit of governmental support from the time such support was initiated until 1983. Figures in excess of this are caused by adding the cost of basic nuclear research, e.g., research on heavy ions in Darmstadt or at the DESY Institute in Hamburg.

Considering the foregoing, an overview of the FRG budgets and those of the individual nuclear research centers for the last few years show governmental expenditures and revenues for nuclear research as summarized in Table 1.

The net government expenditures of DM 1.6 billion for 1983 indicated in Table 1 are lower than the DM 2.2 billion which the FRG Government cites for nuclear research and technology alone for 1983. The difference can be explained by the fact that in the FRG budget the total costs of the nuclear research centers include the government participation of nuclear research costs, even though the great majority of nuclear research centers has already embarked upon non-nuclear projects. This will be demonstrated below by an analysis of the nuclear research centers.

Nuclear Research Centers

The 1983 expenditures by nuclear research centers on the basis of the budget are summarized in Table 2.

These institution, called nuclear research centers in a larger sense, will have overall expenditures of DM 1.6 billion in 1983 and have almost 11,000 manpower spaces. The FRG Government underwrites 80 percent of the cost of the nuclear research centers. Essentially this government support consists of direct institutional contributions. The funding of projects by the Federal Government is of subordinate significance and amounts to only 3 percent of the total expenditures of all the nuclear research centers. The remainder of the funds comes from the Federal states and from third parties, particularly from Euratom and from revenues of the research installations. Average payroll costs per manpower space will amount to about DM 63,000 for 1983. The share of payroll costs of the overall expenditures amounts to 42 percent and is relatively small compared with international averages. It would however be wrong to represent these expenditures by nuclear research centers as expenditures for nuclear research, including nuclear fusion, inasmuch as these centers work in a variety of research areas, as fortunately reported annually and

systematically by the Arbeitsgemeinschaft der Grossforschungseinrichtungen [Association of Major Research Installations] (AGF). The program budgets of the individual centers provide an excellent overview of the research areas emphasized. Using the figures shown therein for the expenditures of the nuclear research centers in behalf of the various nuclear research areas, we arrive for 1982 (the last year for which figures are available) at the expenditures by the nuclear research centers for the nuclear research area (Table 3).

The overall connection between these support funds reported for individual subject areas and the total expenditures is a bit complex, since the allocation to overhead costs is not uniformly handled in the individual centers. For 1982, nuclear research expenditures in the nuclear research centers are reported to be DM 571 million. Assuming a supplement of 10 percent being contained in these costs so as to arrive at comparability with total expenditures, the maximum 1982 research expenditures in the nuclear research centers in the line item nuclear research would amount to DM 630 million. This would correspond to a 41 percent share of the total expenditures of the nuclear research centers. That is why the nuclear research centers are no longer nuclear research centers, but have developed into non-nuclear research centers. With an expenditure share of 41 percent, research in splitting the atom and nuclear fusion is but a small part of the research program in the centers concerned. Thus of course a simple addition of the overall total expenditures made by nuclear research centers results in wrong figures concerning the extent of government support for nuclear research and technology.

We must consider, as we have done in Table 1, the amount of government revenues resulting from the law concerning the permanent disposal sinking fund. In any case, what happens is that for the specific purpose of permanent disposal of radioactive waste in 1983 the advance payments by the economy are even greater than actual R&D expenditures in the area of final waste disposal. Table 1 contains the entire officially reported expenditures for disposal amounting to DM 389.7 million for 1983. This includes expenditures by the nuclear research centers, funding support by the Ministry for Research and Technology for waste disposal and fuel element development, as well as the expenditures by the Federal Physical and Technological Center (PTB) for the item permanent waste disposal. For 1982, the FRG Government will spend about DM 1.6 billion in research funds for nuclear power research in the FRG. In relation to about 65 billion kWh nuclear electric power which could be produced in 1982, this means 2.5 pfennigs [DM 0.025] of research funds per kilowatt hour of nuclear generated electricity. In France, actual expenditures for civil nuclear research and technology are smaller, while nuclear generated electricity production is greater. This indicates that specific research outlays per kilowatt hour are smaller. They amount to about 0.8 pfennings [DM 0.08] per kilowatt hour.

We should mention also that a portion of governmental nuclear research expenditures depends upon political decisions which have little to do with

nuclear research and technology. As an example, among the governmental nuclear research expenditures for 1982 by the ministry of the interior, under the listing "reactor safety and radiation protection," we find a Federal payment of DM 50 million to the state of Lower Saxony. This amount was paid in settlement of a political agreement and had nothing whatever to do with nuclear research. This example proves that the designation "nuclear research expenditure" in government budgets is problematic. Additionally, we must be aware of the fact that especially for political reasons nuclear research in the FRG has been conducted in an atmosphere of embarrassment, since research results cannot be applied in actual practice. One example is the area of nuclear waste disposal, where certain installations were not constructed because of political pressure, while at the same time new areas of research were stimulated, also by political pressure, which now show up in the statistics (e.g.: alternative disposal technologies).

It is true that in the FRG there is a formal governmental energy research program which is to be conducted in a goal-directed manner. In actual practice this is however only partially true. This applies to the state as well as to the economy-related sector. Nuclear research expenditures are by no means a guarantee that the FRG occupies a leading role in nuclear technology. The deciding factor would be to have the possibility of converting research results into actual practice, and to do so without a variety of political obstacles. Only a close link between innovation and research would provide nuclear research, and especially the nuclear researchers, with the motivation of pursuing their tasks in an energetic manner.

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Table 1. Government Expenditures and Revenues for Nuclear Research 1981-1983 in the FRG[1]

Subject Area	Year Est. 1983	Est. 1982	Actual 1981
1. Safety in Nuclear Tech. Installations			
- Nuclear Research Centers	112.5	100.3	94.5
- Project Support	196.8	247.1	204.8
2. Fast Breeder			
- Nuclear Research Centers	99.0	99.2	96.9
- Project Support	282.5	227.5	230.1
3. High Temperature Reactors			
- Nuclear Research Centers	79.8	92.2	97.0
- Project Support	282.5	199.5	161.9
4. Uranium Enrichment			
- Nuclear Research Centers	20.0	18.6	16.9
- Project Support	99.0	98.5	91.0

[1] Sources: Footnotes 3 through 6

5. Reprocessing/Perm. Disposal/PTB			
- Nuclear Research Centers	157.2	135.7	107.2
- Project Support	232.5	184.9	135.2
6. Other Project Support	46.8	46.7	34.8
7. Nuclear Fusion			
- Nuclear Research Centers	156.8	139.3	145.0
Total Expenditures	1,765.4	1,589.5	1,415.0
8.1 Revenues per Sinking Fund Law	150.0	124.0	-
8.2 Other Revenues	0.4	0.4	0.4
Net Governmental Expenditures	1,615.0	1,465.1	1,414.9

Table 2. Expenditures of Nuclear Research Centers 1983 (in Million DM[1])

Tabelle 2: Ausgaben der Kernforschungszentren 1983 in Millionen DM[1])

Name	Gesamt (1) (1)	davon Personal-ausgaben (2) (2)	Finanzierung von (1) durch (3)				Plan-stellen (8)
			direkt Bund (4)	Projekt-förderung (5)	Länder (6)	Dritte (7)	
KfK Karlsruhe	605,4	210,0	459,5	11,2	50.9	83.7	3 370
KfA Jülich	445,8	229,7	347.3	24.6	38.6	35.3	3 519
HMI Berlin	102,4	37,4	84.1	5,9	9.4	3.0	505
GSF München	121,4	66,5	100.6	5.5	9,4	6.0	1 150
DESY Hamburg	160,3	65,8	132.8	0.7	14.8	12.0	1 043
GSI Darmstadt	80,4	29,7	70.0	2,6	7.1	0.7	459
IPP Garching	130,8	57,9	75.6	—	8.4	46.8	936
Gesamt (1)	1 646,5	697,0	1 269.9	50.5	148.0	187.5	10 982

(9) 1) Quelle: Fußnote 4).

KEY:
1. Total (1)
2. Personnel costs Contained in (1)
3. (1) Financed by:
4. Fed Govt Direct Support
5. Project Support
6. Fed. States
7. Third Parties
8. Manpower Spaces
9. Source: Footnote 4

Table 3. Expenditures by Nuclear Research Centers for Nuclear Research (in Million DM[1])

Tabelle 3: Ausgaben der Kernforschungszentren für Kernforschung in Millionen DM 1982[1])

(1) Sachgebiet / Name	(2) Fusion	SNR	(3) HTR	(4) Entsorgung	(5) Sonstige	(6) Gesamt-Kernforschung	(7) Gesamtetat
KfK Karlsruhe	6,2	96.6		67,5	64,1	234,4	601,5
KfA Jülich	38,2	2,6	91,1	10.9	16,0	158,8	425,2
HMI Berlin	1,9		1,1	5.0		8,0	89,5
GSF München				11.9		11.9	130,2
GKSS Geesthacht					41.5	41,5	97,4
IPP Garching	88,1					88,1	116.8
GSI Darmstadt	4,9					4,9	76,9
Gesamt (8)	139,3	99.2	92.2	95,3	118,9	570,8	1 537,5

[1]) Quelle: Fußnoten [3]) und [4]). (9)

KEY:
1. Subject Area
2. Fast Breeder Reactor
3. High Temperature Reactor
4. Waste Disposal
5. Other
6. Total Nuclear Research
7. Total Budget
8. Total
9. Source: Footnotes 3 and 4

FOOTNOTES

1. Gries, W. What is the amount of government expenditures for nuclear energy? ATOMWIRTSCHAFT 24, August/September 1979, p 415

2. Federal Ministry for Research and Technology and predecessors; first through fourth nuclear program, energy research program 1977-1980.

3. Arbeitsgemeinschaft der Grossforscheinrichtungen (AGF) [Association of Major Research Installations]--Program Budget 1982.

4. Federal Budget 1983 (Bundestag Publication 9/1920, Individual Plan 30, Chapter 3005).

5. Federal Budget 1983, Individual Plan 6, Chapter 0627.

6. Federal Budget 1983, Individual Plan 9, Chapter 0903.

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CSO: 5100/2535

STORAGE, REPROCESSING FACILITIES SURVEYED

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 26 Nov 82 p 4

[Text] Frankfurt, November--In the FRG, the handling of spent fuel elements from nuclear power plants is subsumed under the heading "nuclear waste disposal" ["Nukleare Entsorgung"]. At the present time there are 11 large nuclear power plants operating in the FRG, with an output of 9,850 megawatts. In 1982 they are expected to generate about 60 billion kilowatt-hours of electricity, which corresponds to the combustion of 18 million tons of hard coal. These German nuclear power plants make use of the "enriched uranium" which is extracted from natural uranium of the earth. For this purpose one needs about six units of natural uranium for each unit of enriched uranium. This already represents the beginning of the first waste-disposal stage, since at present five parts of natural uranium--the so-called depleted uranium--must be stored while only the enriched uranium is used for the generation of energy in the light-water reactors. In the FRG today, 264 million kilowatt-hours of electricity are generated from 1 ton of enriched uranium, with this corresponding to the combustion of 80,000 tons of hard coal.

700 Tons of Spent Fuel Elements Annually

But the extent of utilization can be increased more. The hope is to achieve this in the next few years by a number of different measures. These are subsumed under the concept "burnup enhancement." The advantage of doing this lies in the result that thereupon the tonnage of fuel elements to be disposed of relative to the amount of electricity produced will decrease. From these numerical relations one can figure out what quantity of spent fuel elements will be produced through the generation of given amounts of electricity from nuclear power up to the year 2000 in the FRG. The total tonnage of spent fuel elements in the FRG will increase to a maximum of 10,000 tons of spent fuel elements by the year 2000. As matters now stand, 3,000 tons of this will be disposed of by way of arrangements made with foreign countries, so that the fuel-element tonnage to be disposed of in this country is about 7,000 tons. If we can figure on having an installed nuclear power output of about 35,000 megawatts in the FRG in the year 2000, then about 700 tons of spent fuel elements will be produced annually, given the extent of burnup to be expected at that time.

Radioactive wastes likewise are produced at various stages of the nuclear fuel cycle via the operation of the nuclear power plants, but for the most part these

wastes are only weakly radioactive. At present they are being stored in appropriate casking, a procedure which reduces the costs, above all because of a reduction in volume. Following an interim storage, they are supposed to be buried in a geological formation, for example the ore mine of Konrad, the salt mine at Asse, or the ultimate storage facility in Gorleben. In the FRG a waste-disposal concept has been developed which is being realized jointly by the State and industry and which extends from the unloading of the fuel elements from the nuclear power plants up to the ultimate disposal of the radioactive wastes. The objective situation in the autumn of 1982 presents itself as follows:

Interim storage: The construction measures for the interim storage facility at Gorleben are progressing rapidly. The application for the interim storage facility was filed with the Federal Physical-Technical Institute on 3 April 1980 by the German Association for the Reprocessing of Nuclear Fuels (DWK). In this interim storage facility, fuel elements are to be stored in special transport casks. The permit required for this under the Atomic Energy Law is expected for 1984. The experts' reports necessary for this purpose which the Federal Physical-Technical Institute had ordered will be completed in the fourth quarter of 1982, according to information from the Federal Government.

In January, a second interim storage facility was applied for by the DWK and the Steag [Steinkohlen-Elektrizitaet AG] company for the Ahaus site, with 1,500 tons of storage capacity. This application was altered on 3 October 1979 to read that a storage in transport casks was planned. The reports on this application ordered by the Federal Physical-Technical Institute are expected in the fourth quarter of 1982. A hearing is to take place in March 1983. The probable date for issuing the storage permit is 1985.

Above-ground Storage May Be Practical

Moreover, interim storage facilities for the nuclear power plants at Wuergasse and Stade have been applied for by the operating companies. A storage capacity within the transport casks for spent fuel elements is to be provided on the premises of these nuclear power plants. The licensing procedure is under way, with public participation in accordance with Paragraph 7 of the Atomic Energy Law. No decisions have been made as yet on the applications. Since the construction work at Gorleben is progressing speedily and since the use of transport casks has already been approved, this ensures that there will be an interim storage of fuel elements, on which also the waste-disposal certification for German nuclear power plants is relying to an increasing extent.

Reprocessing/alternative waste disposal: The interim storage of spent fuel elements is a practice being employed worldwide for the purpose of safely carrying out waste disposal on a long-term basis. Its advantage lies above all in the fact that over a period of time a large number of radioactive elements become less of a problem because of their decay. Also, there is a marked decrease in the heat emission--something which must be taken into consideration with highly radioactive wastes and with spent fuel elements. In this connection, it is important to note that after 100 years the vitrified blocks have only a tenth of the heat emission compared to the levels for production in a reprocessing plant. On the other hand, with a spent fuel element the heat decreases by

a factor of only four in a comparable period of time. It follows from this that an above-ground storage of vitrified highly radioactive waste may be very practical for the purpose of reducing the heat load in a mine, whereas in spent fuel elements the heat emission does not fall off so rapidly.

Reprocessing Being Practiced

In the FRG, two ways for the handling of spent fuel elements are being pursued: That is, the reprocessing of the fuel elements, and a possible direct ultimate storage of the fuel elements. The reprocessing of spent fuel elements is already feasible on the basis of the present level of science and technology, and it has already been put into practice on a large industrial scale in numerous countries.

In the FRG, the objective situation with respect to realizing this process is as follows: The land-use planning procedure for a reprocessing plant in the Schwandorf area has been completed; a site near the village of Wackersdorf has been designated. The proceedings based on the Atomic Energy Law have been initiated. In Lower Saxony, nuclear-legislation proceedings for a reprocessing plant have been instituted by the DWK. The Land Government has proposed the Dragahn site. In the other Federal Lands of Hesse and Rhineland-Palatinate, the siting plans are being dropped.

Aside from these domestic efforts for the construction and operation of an independent German reprocessing plant, a disposing of German fuel elements by means of reprocessing in foreign countries is also going on. On this score, we have contracts with the French firm of Cogema [Compagnie Generale des Matieres Nucleaires] and with the British firm of BNFL [British Nuclear Fuels Limited] for a total of 2,900 tons. Practically speaking, this means the shifting of jobs to foreign countries because of the fact that in the 1970's the requisite decisions were not made for a domestic waste disposal system with reprocessing and interim storage for a relatively long term. The foreign contracts on reprocessing are clearly the result of basic political conditions in the waste disposal sector. It would have been just as easy to have created the necessary interim storage capacity for disposing of these 2,900 tons of wastes.

That would have ensured a considerable number of jobs to the steel industry and would have made unnecessary quite a few governmental assistance programs for the steel industry. The foreign contracts for reprocessing are a typical example of the shifting of jobs from the FRG into foreign countries on account of political decisions. They were not necessary for the waste-disposal problem, since there was no objective reason at all for having to obtain the waste-disposal certification by way of a reprocessing performed in foreign countries.

In connection with the German reprocessing plant, the corresponding measures for the handling of radioactive wastes are being taken also, above all in the construction of a vitrification plant for highly radioactive waste at Mol (Belgium). In this case as well, the simple licensing procedure existing in Belgium was the decisive reason why the vitrification plant was constructed in Belgium and not in the FRG.

The direct ultimate storage of fuel elements is a possibility being pursued within the framework of a research program. But in contrast to reprocessing,

the current level of technology on this is not high. According to current research results based on the German research program as well as on international research programs, especially in the United States and Sweden, it can be stated that the direct ultimate storage of fuel elements is technically possible and ecologically sound. By the middle of the 1980's a decision is to be made in the FRG on whether and to what degree the disposal of the wastes from nuclear power plants will be done by means of reprocessing or by direct ultimate storage, or with a mixed system.

Ultimate Storage Throws Away Options

Assuming that reprocessing and direct ultimate storage are considered to be equally suited to the final disposal of fuel elements, then in addition to the level of science and technology for the two procedures, it is likely that above all the costs for the two variants and the uranium prices will have a decisive influence on what eventually happens with fuel elements in the FRG. But the decision to be made by politicians in the mid-1980's concerning waste disposal on a commercial scale must also take into account the fact that with an early direct ultimate storage of fuel elements, all the options are lost with respect to a future utilization of the raw materials contained in the fuel elements. Therefore it should be expected that even after the decision by the politicians in the mid-1980's, reprocessing will be at the focus of waste disposal, assisted by a licensed interim storage of fuel elements for a relatively long term, and that direct ultimate storage will come into question only for a portion of the fuel elements.

Ultimate storage: In the FRG, the State is responsible for ultimate storage. Over 95 percent of all wastes from the utilization of nuclear energy are weakly radioactive. Here, little is gained by an above-ground storage, because the heat generated is quite slight. These wastes should be put into a geological formation as soon as possible. Up to 1979 the salt mine of Asse was available for this purpose. Since then the wastes have been stored above ground. Submerging them in the ocean is not being done by the FRG, in contrast to other partners in the West. The intention is to put them into the Konrad ore mine and particularly in the planned ultimate storage facility of Gorleben, as well as in the Asse salt mine. A plan-assessment procedure for the Konrad ore mine has been initiated. At Gorleben, research and development work is advancing speedily for the ultimate storage facility there.

Markedly Increased Storage Capacity

Two thirds of the capacity volume at Gorleben is being earmarked especially as an ultimate storage facility for highly radioactive waste. Highly radioactive vitrified waste is to be accommodated in the salt mine of Gorleben following an interim storage. As was already remarked above, it is practical to thus store this vitrified highly radioactive waste for up to 100 years. If this is done, one does not need nearly so much ultimate-storage volume. Therefore the capacity of the Gorleben ultimate storage facility can be increased markedly if the vitrified highly radioactive waste is stored for an appropriate time above ground.

There is no reason at all to make waste disposal from nuclear power plants contingent on a corresponding availability for highly radioactive waste at the Gorleben ultimate storage facility. Although in the past that has been done for political reasons, in the original waste-disposal concept which the Federal Government had submitted at the beginning of the 1960's that was never under consideration. In view of the long periods of time which must be taken into account in the disposal of nuclear wastes, it makes no sense at all to be very hasty in burying the highly radioactive waste underground. This is expensive, creates unnecessary problems, and therefore is a course being followed only in the FRG. No other country in the world intends to store vitrified highly radioactive waste underground after only 10 or 20 years.

When all the stages in the disposal of spent fuel elements are considered, it can be stated that the necessary measures have all been instituted, that despite particular weak points the disposal of wastes from the nuclear power plants in the FRG occupies a leading position on a worldwide scale, and that there is no reason whatsoever to speak about an "unsolved waste disposal problem" in the FRG.

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SOVIET-MADE LOVIISA NUCLEAR UNIT RECONNECTED TO POWER GRID

Helsinki HELSIGIN SANOMAT in Finnish 28 Dec 82 p 7

[Article: "Loviisa 2 Now In National Network"]

[Text] The second unit of the Loviisa nuclear generating plant was reconnected into the national grid on 26 December 1982 after completion of extensive annual maintenance work extending over a period of two months.

For the time being, the unit is operating at half of its capacity owing to maintenance work still being done on the other turbogenerator. That work is expected to reach completion in a few days.

On the main, the guarantee period of the Loviisa 2 unit is also nearing termination. The guarantee period ended mainly already in early September 1982, but in respect to the rotating parts of the turbogenerator and the corrosion-resistant coatings in the pressure boilers it does not end until 5 January 1983.

One of the most noteworthy projects in the annual maintenance was the inspection of the inner surfaces of the pressure containers, still under guarantee. According to Imatran Voima spokesmen no new deficiencies were noted, and that the next similar inspection is due at the earliest four years from now.

In order to conduct the inspection of the inner surfaces, it was necessary to dismantle the reactor of the Loviisa 2 unit. The dismantling, inspecting, and reassembling caused an extension of the maintenance operation, normally one month, to two months. Nonetheless the Imatran Voima was able to carry out the annual maintenance within the schedule that it had planned for that operation.

At this time changes were made within the radioactive sphere in the Loviisa 2 unit for the prevention of the formation of waterlocks. A waterlock in a curve in the piping system could obstruct natural convection circulation causing overheating of the nuclear fuel in an accident situation. Those changes have already been made on the Loviisa 1 unit.

When the Loviisa 2 unit is placed back into operation, all four of the nuclear generating units in Finland will be in operation. The Loviisa 1 unit is operating at its full rated capacity of 465 megawatts. During the Christmas holidays the Teollisuuden Voima Oy (TVO) 1 unit rated at 660 megawatts operated at

65 percent of its rating. On 27 December it was operating at 85 percent of capacity. The TVO 2 unit is operating at full capacity.

An Increase in the Proportion of Nuclear Power

Statistics provided by the Suomen Sahkolaitosyhdistys (Association of Finland's Electric Power Installations) indicate that, during the 12-month period ending 30 November 1982, the proportion of electricity produced in Finland by nuclear power rose to 37.9 percent of the total. The proportion during the previous corresponding period was 34 percent.

The overall production of electricity during the period increased by slightly less than 2 percent. The prediction for 1982 by the Collaborative Committee of the Electrical Producers was 3 percent.

The overall production during the last period was 41.8 billion kilowatt hours. Of that amount 31 percent (31.6 percent in the preceding period) was produced by hydropower, 21.3 percent (22.7 percent) by counterpressure means, 4.4 percent (6.4 percent) by conventional condenser power as at the Inkoo coal-fired thermal plants, and the gross amount of imported electricity was 5.4 percent (5.3 percent).

The industrial proportion during the last period of the electricity produced by counterpressure power was 5 billion kilowatt hours, which figure is 600 million kilowatt hours less than during the previous period.

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BRIEFS

PLANTS REAPPLY FOR OPERATING PERMITS--The Imatran Voima Oy (IVO) and the Teollisuuden Voima Oy (TVO) have filed applications at the Ministry of Trade and Industry for the extension of the operating permits of their nuclear generating plants. The permits of the Loviisa 2 and the TVO 1 and TVO 2 units will remain in force until the end of 1983. The Loviisa 1 unit was originally granted a permanent permit, but because of changes in the legislation, installations subsequently constructed have been granted only temporary operating permits. Permanent permits could not be granted to the three newer installations because disposal of the spent nuclear fuel from them has not been arranged in accordance with law. Also, inspection of the waste disposal methods at each installation is necessary prior to granting of renewal permits, according to the Ministry of Trade and Industry. Estimates at the Ministry are that the preparations necessary for the granting of the permits will require time until near the end of 1983. The intention is to ask the applicants to submit several statements during the course of spring 1983 as a basis for the making of decisions. The decision can eventually be made at the Ministry of Trade and Industry, but in practice the matter may be decided at the Cabinet level, unless an amendment to the nuclear energy legislation is enacted in the meantime. All of the current operating permits have been granted by the Cabinet. [Text] [Helsinki HELSINGIN SANOMAT in Finnish 30 Dec 82] 5955

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RAPSODIE TO BE DISMANTLED; EQUIPMENT STUDIED

Paris NUCLELEC in French 7 Oct 82 pp 10568, 10569

[Article: "Breeder Reactors/France. Definitive Shutdown of the Experimental Reactor Rapsodie"]

[Text] Rapsodie, the first French experimental fast neutron reactor cooled by liquid sodium, in service at the Nuclear Research Center at Cadarache since 1967, will not be started up again. It had been shut down since January 1982 because a slight nitrogen leak had appeared on the double covering surrounding the main vessel containing the reactor core.

The Atomic Energy Commission indicates that this decision was made after detailed research on the means, time involved and costs required to repair the defect. This repair was technically possible but would, however, turn out to be complicated, time-consuming and costly. In addition, the reactor is relatively old (more than 15 years in operation) and it has already fulfilled its assigned objectives.

Rapsodie, the first large stage in development of the breeder reactor type in France, whose initial thermal power of 24 MW (without production of electricity) was upped to 40 MW in 1970, was, in fact, designed at the beginning of the 1960's for the following purposes: to demonstrate the concept, safety and operational reliability of a fast reactor on a significant experimental scale, to test the principal components in sodium and to develop and qualify the fuels for this type of reactor. The complete success of the early operation made possible the decision to build the Phenix, a demonstration reactor for production of electricity (250 MW), whose principal components were extrapolated from the Rapsodie and whose remarkable success confirmed our solid position throughout the world (close to 11 billion kilowatt-hours produced since start-up in 1973). After the start-up of Phenix, Rapsodie was basically used for intensive experimentation on fuels both for exploration of the operating limits and for new designs allowing high combustion rates, while Phenix served as a demonstration unit on an industrial scale. Success in operating these two reactors makes it possible to launch the stage of the high powered prototype represented by the Superphenix reactor currently being finished at Creys-Malville (1,200 MW electricity) in cooperation with the three DEBENE nations (FRG, Holland, Belgium) and Italy.

The Rapsodie operating experiment has been entirely satisfactory. Since the beginning, the availability rate has been 73.5 percent; the load factor, 54.5 percent; a thermal energy of 1.827 billion kWh has been produced; and 2,703 JEPP (Equivalent Full Power Days) have been completed. More than 30,000 fuel rods have been irradiated, a large number of them at very high combustion rates, the record being 210,000 megawatt-days per ton of fuel on a 61-rod assembly. From every possible standpoint (safety, reliability, demonstration of the process, fuel development), Rapsodie has fulfilled its experimental role very well.

The qualification of still higher performance fuels from the standpoint of combustion rates through the use of new sheathing materials that eliminate the excessive swelling of steels under the effect of neutron fluxes will henceforth be done entirely in the Phenix, which is well-suited to this purpose, while the more analytical experimental program of a fairly limited nature remaining to be carried out will be done on other reactors (CEA experimental piles or foreign reactors in the context of international collaboration).

The Rapsodie dismantling will be rich in information. First, it will contribute precious information for this type on the behavior of all of the components and materials after 15 years of operation and, specifically, on the materials having the defect described above.

This dismantling will also be conducted with specific attention to acquiring the maximum of experience in this type of operation.

A plan for the reclassification of operating personnel is being drawn up. Those personnel who have acquired valuable competence will be transfered primarily to the neighboring breeder reactor research and development area at the same Cadarache center.

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PROBLEMS AT SAINT-LAURENT, CHINON, GRAVELINES, FESSENHEIM

Paris NUCLELEC in French 28 Oct 82 pp 10584-10586

[Article: "Nuclear Power Plants/France: Operation in September 1982"]

[Excerpts] According to EDF [French Electricity Company] management, the operation of nuclear equipment has been characterized by an average availability of 51 percent (50 percent for the 900-MW PWR equipment alone). In addition to the high number of programmed shutdowns during the summer period, this modest result is essentially the result of technical difficulties encountered on Fessenheim 1, Bugey 2 and 4 (centering rods of the guide tubes of the control rods) and Saint-Laurent B1 and B] (drier-superheater and alternator rotor).

The annual shutdown operations for maintenance and refueling have begun for Dampierre 1. They are being continued on Gravelines 2 and 3 and Dampierre 3 and have been finished at Tricastin 3.

Units of the natural uranium gas-graphite type at Marcoule G3, Bugey 1 and Chnon A2 have operated satisfactorily.

During the month of September, the Monts d'Arree power plant started its annual shutdown for programmed maintenance.

As for the participating units, the annual shutdown at Chooz ended during September; Phenix operated at two-thirds of its nominal power, with the exception of a shutdown period for the purpose of various monitoring....

Noteworthy events:

During the annual shutdown for maintenance and refueling at Bugey 4, the televisual examination of the pin nuts of the control array guide tubes showed a pin broken in its housing. Technical difficulties of the same nature had been observed previously at Fessenheim 1 in March 1982, then at Bugey 2 in July 1982. The beginning of repair work, finished at Fessenheim 1 since the end of the month of September, after qualification of repair materials and procedures, should make it possible to regain the availability of these units prior to the end of the year 1982.

Gravelines B1 remained shut down through the entire month of September in order to allow rebuilding and monitoring of the tightness of the primary pumps.

Examination of the hoops (holding devices for the coil heads) of the alternator rotor at Saint-Laurent B1 revealed a state of corrosion requiring further expert examination. Similar investigations on the Chinon B1 rotor have led to delaying the first connection of this unit to the network.

Blayais 2, in the start-up test phase, reached its nominal power on 13 September 1982

For the natural uranium gas-graphite type, Chinon A3 remained shut down to temporarily avoid progression of the deteriorated state observed on certain internal structures of the reactor while awaiting the development of appropriate repair materials and procedures.

The gradual restarting of Saint-Laurent A2 following the 13 March 1980 incident presented no particular difficulties.

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RADIOACTIVE WASTE STORAGE ON LAND

The Hague ANP NEWS BULLETIN in English 7 Dec 82 p 3

[Text] The Hague, December 6--Dutch radioactive waste will be stored on a site at Velsen near IJmuiden over the next ten years, so that dumping in the Atlantic will stop as from 1983, Housing, Physical Planning and Environment Minister Pieter Winsemius said today.

He informed the second chamber that a Central Organisation for Radioactive Waste (Covra by its Dutch initials) would be set up, to take over care for the country's radioactive waste from the ENC Netherlands Energy Research Centre.

The one-hectare storage site with a builtup area of 2,800 square metres is located on the North Sea Canal and the Velsen road tunnel. It is bounded by an industrial site, allotment gardens and farmland.

Dr Winsemius said measures would be taken to guarantee the safety of the population and environment in the area.

The waste to be stored at Velsen is from hospitals, universities, laboratories and nuclear power stations, the minister said, adding that highly radioactive and fissionable waste from nuclear power stations 'is being processed and stored in a wholly different manner'. (It is being reprocessed in France and Britain.)

He said the storage at Velsen would be temporary. A special committee would study a final solution for the removal of the waste and present a report to the government not later than in March, 1984, he said.

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END